DRINKING WATER SURVEILLANCE PROGRAM

CAYUGA WATER TREATMENT PLANT

ANNUAL REPORT 1990

Ontario Environment Environnement

ISSN 0843-8323

CAYUGA
WATER TREATMENT PLANT

DRINKING WATER SURVEILLANCE PROGRAM

ANNUAL REPORT 1990

AUGUST 1992

Cette publication technique
n'est disponible qu'en anglais.

Copyright: Queen's Printer for Ontario, 1992
This publication may be reproduced for non-commercial purposes
with appropriate attribution.

PIBS 2034
Log 92-2302-254

93-02514/

EXECUTIVE SUMMARY

DRINKING WATER SURVEILLANCE PROGRAM

CAYUGA WATER TREATMENT PLANT
1990 ANNUAL REPORT

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

The Cayuga water treatment plant is a conventional treatment plant which treats water from the Grand River. The process consists of coagulation, flocculation, clarification (upflow clarifier), filtration (using pressure filters) and disinfection. This plant has a rated capacity of 1.1 x 1000 m^3/day. The Cayuga water treatment plant serves a population of approximately 1,300.

Raw and treated water at the plant was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall.

Table A is a summary of all results by group.

No known health related guidelines were exceeded.

The Cayuga water treatment plant, for the sample year of 1990, produced good quality water. No samples were taken in the distribution system.

TABLE A

DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP

SUMMARY TABLE BY SCAN

A POSITIVE VALUE DENOTES THAT THE RESULT IS GREATER THAN THE STATISTICAL LIMIT OF DETECTION AND IS QUANTIFIABLE

A '.' INDICATES THAT NO SAMPLE WAS TAKEN

SCAN	SITE RAW TESTS	RAW POSITIVE	RAW %POSITIVE	TREATED TESTS	TREATED POSITIVE	TREATED %POSITIVE
BACTERIOLOGICAL	33	28	84	11	9	81
CHEMISTRY (FLD)	36	36	100	77	77	100
CHEMISTRY (LAB)	264	247	93	286	234	81
METALS	288	147	51	308	131	42
CHLOROAROMATICS	154	0	0	182	0	0
CHLOROPHENOLS	12	0	0	12	0	0
PAH	200	0	0	218	0	0
PESTICIDES & PCB	387	1	0	442	1	0
PHENOLICS	12	6	50	13	7	53
SPECIFIC PESTICIDES	64	0	0	66	0	0
VOLATILES	348	4	1	377	49	12
TOTAL	1798	469		1992	508	

DRINKING WATER SURVEILLANCE PROGRAM

CAYUGA WATER TREATMENT PLANT
1990 ANNUAL REPORT

INTRODUCTION

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

Appendix A has a full description of the DWSP.

The DWSP was initiated for the Cayuga water treatment plant in winter of 1987. Previous annual reports have been published for 1987, 1988 and 1989.

PLANT DESCRIPTION

The Cayuga water treatment plant is a conventional treatment plant which treats water from the Grand River. The process consists of coagulation, flocculation, clarification (upflow clarifier), filtration (using pressure filters) and disinfection. This plant has a rated capacity of 1.1 x 1000 m^3/day. The Cayuga water treatment plant serves a population of approximately 1,300.

The sample day flows ranged from 0.5 x 1000 m^3/day to 1.0 x 1000 m^3/day.

General plant information is presented in Table 1 and a schematic of plant processes, chemical addition points and sampling locations in Figure 1.

SAMPLING AND ANALYSES

Sample lines in the plant were flushed prior to sampling to ensure that the water obtained was indicative of its origin and not residual water standing in the sample line.

At all distribution system locations two types of samples were obtained, a standing and a free flow. The standing sample consisted of water that had been in the household plumbing and service connection for a minimum of six hours. These samples were used to make an assessment of the change in the levels of inorganic compounds and metals, due to leaching from, or deposition on, the plumbing system. The only analyses carried out on the standing samples therefore, were General Chemistry and Metals. The free flow

sample represented fresh water from the distribution main, since the sample tap was flushed for five minutes prior to sampling.

Attempts were made to capture the same block of water at each sampling point by taking the retention time into consideration. Retention time was calculated by dividing the volume of water between two sampling points by sample day flow. For example, if it was determined that retention time within the plant was five hours, then there would be a five hour interval between the raw and treated sampling. Similarly, if it was estimated that it took approximately one day for the water to travel from the plant to the distribution system site, this site would be sampled one day after the treated water from the plant.

Stringent DWSP sampling protocols were followed to ensure that all samples were taken in a uniform manner (see Appendix B).

Plant operating personnel routinely analyze parameters for process control (Table 2).

Water at the plant and at one location in the distribution system was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall. Laboratory analyses were conducted at the Ministry of the Environment facilities in Rexdale, Ontario.

RESULTS

Field measurements were recorded on the day of sampling and were entered onto the DWSP database as submitted by plant personnel.

Table 3 contains information on delay time between raw and treated water sampling, flow rate, and treatment chemical dosages.

Table 4 is a summary break-down of the number of water samples analyzed by parameter and by water type. The number of times that a positive or trace result was detected is also reported.

Positive denotes that the result is greater than the statistical limit of detection established by the Ministry of the Environment laboratory staff and is quantifiable. Trace (<T) denotes that the level measured is greater than the lowest value detectable by the method but lies so close to the detection limit that it cannot be confidently quantified.

Table 5 presents the results for parameters detected on at least one occasion.

Table 6 lists all parameters analyzed in the DWSP.

Associated guidelines and detection limits are also supplied on Tables 5 and 6. Parameters are listed alphabetically within each scan.

DISCUSSION

GENERAL

Water quality was judged by comparison with the Ontario Drinking Water Objectives publication (ODWOs). When an Ontario Drinking Water Objective (ODWO) was not available, guidelines/limits from other agencies were used. These guidelines were obtained from the Parameter Listing System database.

IN THIS REPORT, DISCUSSION IS LIMITED TO:

- **THE TREATED AND DISTRIBUTED WATER;**
- **ONLY THOSE PARAMETERS WITH CONCENTRATIONS ABOVE GUIDELINE VALUES; AND**
- **POSITIVE ORGANIC PARAMETERS DETECTED.**

BACTERIOLOGICAL

Guidelines for bacteriological sampling and testing of a supply are developed to maintain a proper supervision of its bacteriological quality. Routine monitoring programs usually require that multiple samples be collected in a given system. Full interpretation of bacteriological quality cannot be made on the basis of single samples.

Standard plate count is a test used to supplement routine analysis for coliform bacteria. The limit for standard plate count (at 35°C after 48 hours) in the ODWOs is 500 counts/mL (based on a geometric mean of 5 or more samples). DWSP bacteriological analysis of treated and distributed water was limited to standard plate count, which may indicate some deterioration in water quality if the guideline of 500 counts/mL is exceeded.

Standard plate count (membrane filtration) exceeded the ODWO Maximum Desirable Concentration of 500 counts/mL in 1 of 10 treated water samples with a maximum reported value of 920.0 counts/mL.

INORGANIC & PHYSICAL

CHEMISTRY (FIELD)

It is desirable that the temperature of drinking water be less than 15°C. The palatability of water is enhanced by its coolness. A temperature below 15°C will tend to reduce the growth of nuisance organisms and hence minimize associated taste, colour, odour and corrosion problems. The temperature of delivered water may increase in the distribution system due to the warming effect of the soil in late summer and fall and/or as a result of higher temperatures in the source water.

Field temperature exceeded the ODWO Maximum Desirable Concentration of 15°C in 4 of 10 treated water samples with a maximum reported value of 24.0°C.

CHEMISTRY (LAB)

Colour in drinking water may be due to the presence of natural or synthetic substances as well as certain metallic ions.

Colour exceeded the ODWO Maximum Desirable Concentration of 5 HZU in 4 of 10 treated water samples with a maximum reported value of 9.0 HZU.

Dissolved organic carbon exceeded the ODWO Maximum Desirable Concentration of 5.0 mg/L in 1 of 10 treated water samples with a maximum reported value of 5.3 mg/L.

The ODWOs indicate that a hardness level of between 80 and 100 mg/L as calcium carbonate for domestic waters provides an acceptable balance between corrosion and encrustation. Water supplies with a hardness greater than 200 mg/L are considered poor and would possess a tendency to form scale deposits and result in excessive soap consumption.

Hardness exceeded the ODWO Aesthetic or Recommended Operational Guideline of 80-100 mg/L in the 10 treated water samples with a maximum reported value of 334.1 mg/L.

Elevated conductivity is often associated with high hardness levels.

Conductivity exceeded the European Economic Community (EEC) Aesthetic Guideline Level of 400 umho/cm in 10 treated water samples with a maximum reported value of 911.0 umho/cm.

Turbidity in water is caused by the presence of suspended matter such as clay, silt, colloidal particles, plankton and other microscopic organisms. The most important potential health effect of turbidity is its interference with disinfection in the treatment

plant and the maintenance of a chlorine residual. The ODWOs Maximum Acceptable Concentration for turbidity is 1 Formazin Turbidity Unit (FTU).

Although, the laboratory turbidity exceeded the Maximum Acceptable Concentration in 1 treated water sample at 1.03 FTU, the corresponding field turbidity result was 0.93 FTU. The latter test result was considered more reliable.

METALS

At present, there is no evidence that aluminum is physiologically harmful and no health limit for drinking water has been specified. The measure of aluminum in treated water is important to indicate the efficiency of the treatment process. The ODWOs indicate that a useful guideline is to maintain a residual below 100 ug/L as aluminum in water leaving the plant, to avoid problems in the distribution system.

Aluminum exceeded the ODWO Aesthetic or Recommended Operational Guideline of 100 ug/L in 7 of 10 treated water samples with a maximum reported value of 430.0 ug/L.

ORGANIC

CHLOROAROMATICS

The results of the chloroaromatic scan showed that none were detected.

CHLOROPHENOLS

The results of the chlorophenol scan showed that none were detected.

POLYAROMATIC HYDROCARBONS (PAH)

The results of the PAH scan showed that none were detected in the treated water.

PESTICIDES & PCB

The results of the PCB scan showed that none were detected.

Atrazine was found at a positive level in 1 sample and at trace levels in another 7 of the 10 treated water samples analyzed. The maximum observed level was 3,040.0 ng/L. This was below the ODWO Interim Maximum Acceptable Concentration of 60,000 ng/L. Traces of des-ethyl atrazine were also reported in 3 treated water samples.

The results of the other parameters in the pesticide scan showed that none were detected above trace levels.

PHENOLICS

Phenolic compounds are present in the aquatic environment as a result of natural and/or industrial processes. The ODWOs recommend, as an operational guideline, that phenolic substances in drinking water not exceed 2.0 ug/L. This limit has been set primarily to prevent undesirable taste and odours, particularly in chlorinated water.

Phenolics exceeded the ODWO Aesthetic or Recommended Operational Guideline of 2 ug/L in 1 of 10 treated water samples with a maximum reported value of 3.2 ug/L.

SPECIFIC PESTICIDES

The results of the specific pesticides scan showed that none were detected.

VOLATILES

The detection of benzene, ethylbenzene, toluene and xylenes at low, trace levels may be a laboratory artifact derived from the analytical methodology.

Trihalomethanes (THMs) are produced during the water treatment process and will always occur in chlorinated waters. THMs are comprised of chloroform, chlorodibromomethane and dichlorobromomethane; bromoform occurs occasionally. Results are reported for the individual compounds as well as for total THMs. Only total THMs results are discussed.

Total THMs were found at positive levels in all 10 treated water samples analyzed. The maximum observed level was 175.4 ug/L. This was below the ODWO Maximum Acceptable Concentration of 350 ug/L.

Prechlorination, using sodium hypochlorite, occurs at the lowlift well. If the chemical feed was not turned off for a sufficient amount of time, sodium hypochlorite contamination could have occurred resulting in trihalomethane formation.

CONCLUSIONS

The Cayuga water treatment plant, for the sample year 1990, produced good quality water. No samples were taken in the distribution.

Persistent findings of atrazine, its metabolite des-ethyl atrazine and traces of other pesticides indicated that the raw water source was impacted by agricultural activity.

FIGURE 1

CAYUGA WATER TREATMENT PLANT

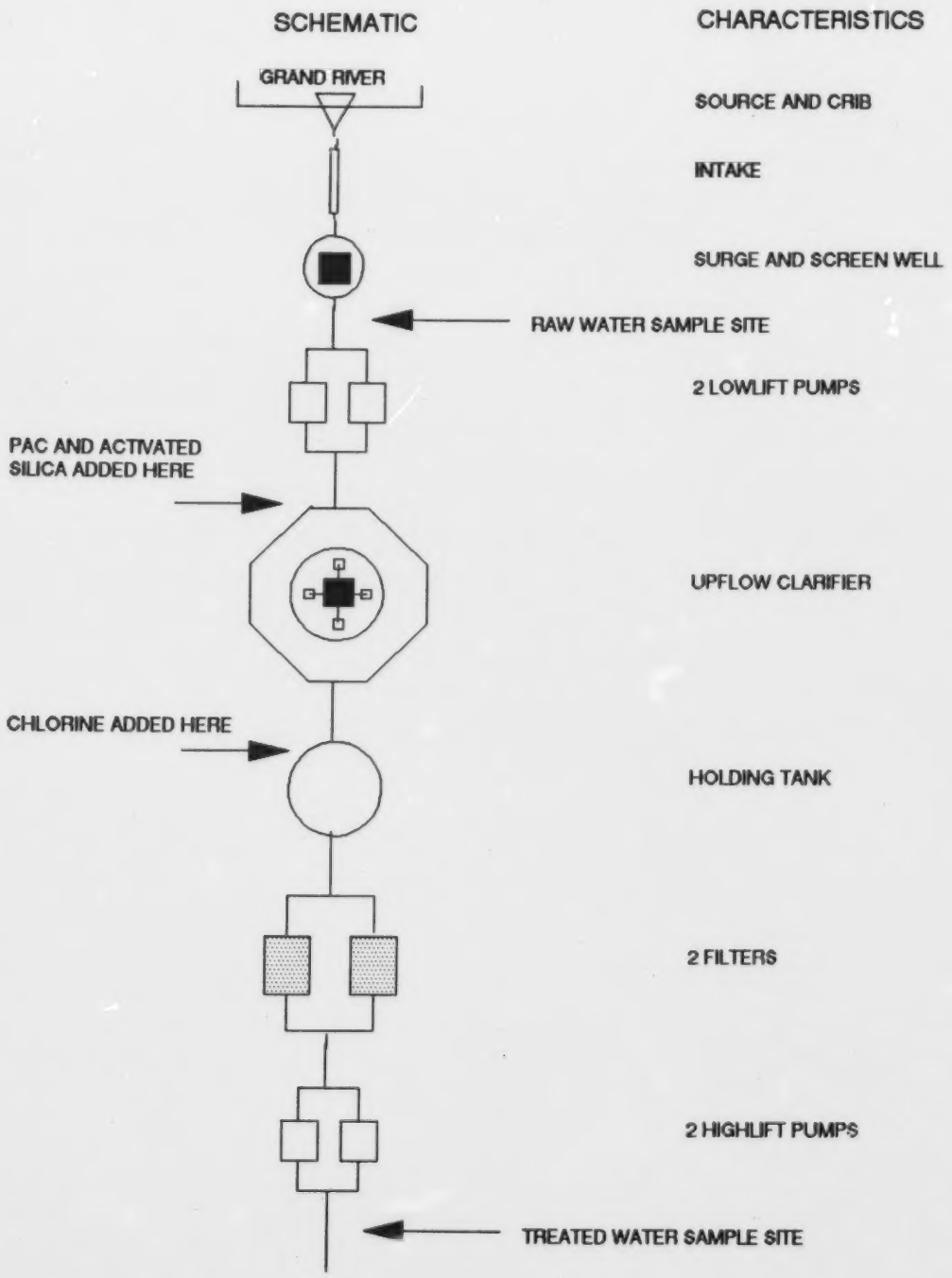

TABLE 1

DRINKING WATER SURVEILLANCE PROGRAM

PLANT GENERAL REPORT

WORKS #: 220001717
PLANT NAME: CAYUGA WTP

DISTRICT: HAMILTON/STONEY-CRK
REGION: WEST CENTRAL
DISTRICT OFFICER :J. VOGT

UTM #: 175926904755650

PLANT SUPERINTENDENT: RON BARRY

ADDRESS: C/O 70 TOWN CENTRE DR
TOWNSEND,ONTARIO
N0A 1S0
(416 772 3212)

MUNICIPALITY: HALDIMAND/NORFOLK
AUTHORITY: PROVINCIAL

PLANT INFORMATION

PLANT VOLUME:	69.290	(X 1000 M3)
DESIGN CAPACITY:	1.200	(X 1000 M3/DAY)
RATED CAPACITY:	1.091	(X 1000 M3/DAY)

MUNICIPALITY	POPULATION
CAYUGA	1,300

TABLE 2
DRINKING WATER SURVEILLANCE PROGRAM
IN-PLANT MONITORING

PARAMETER	LOCATION	FREQUENCY
COMBINED CHLORINE RESIDUAL	TREATED WATER	TWICE/DAY
FREE CHLORINE RESIDUAL	TREATED WATER	TWICE/DAY
TOTAL CHLORINE RESIDUAL	TREATED WATER	TWICE/DAY
PH	AFTER CLARIFIERS	TWICE/DAY
	RAW WATER	TWICE/DAY
	TREATED WATER	TWICE/DAY
TEMPERATURE	AFTER CLARIFIERS	EVERY 3 HOURS
TURBIDITY	AFTER CLARIFIERS	EVERY 3 HOURS
	RAW WATER	EVERY 3 HOURS
	TREATED WATER	EVERY 3 HOURS

TABLE 3

DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP SAMPLE DAY CONDITIONS FOR 1990

			TREATMENT CHEMICAL DOSAGE (MG/L)		
			PRE CHLORINATION	COAGULATION	POST CHLORINATION
DATE	DELAY * TIME(HRS)	FLOW (1000M3)	SODIUM HYPOCHLORITE	POLY ALUMINUM CHLORIDE	CHLORINE
JAN 02	1.00	.545	.	3.50	7.35
FEB 05	1.00	.645	.	18.40	4.49
FEB 27	1.75	.566	5.00	41.66	4.80
MAR 05	1.00	.726	.	17.00	3.27
MAR 20	1.25	.608	4.50	32.50	4.50
APR 02	1.00	.609	.	18.40	2.45
MAY 07	1.00	.651	.	17.00	2.20
JUN 04	1.00	.607	.	18.40	3.27
JUL 03	1.00	.751	.	20.00	3.27
AUG 06	1.00	1.015	.	18.40	3.27
SEP 04	1.00	.804	.	18.40	3.27
NOV 05	1.00	.925	.	18.40	2.45

* THE DELAY TIME BETWEEN THE RAW AND TREATED WATER SAMPLING, SHOULD ESTIMATE THE RETENTION TIME.

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
BACTERIOLOGICAL						
FECAL COLIFORM MF	11	11	0	.	.	.
STANDRD PLATE CNT MF	.	.	.	11	9	0
TOTAL COLIFORM MF	11	6	0	.	.	.
T COLIFORM BCKGRD MF	11	11	0	.	.	.
*TOTAL GROUP BACTERIOLOGICAL	33	28	0	11	9	0
CHEMISTRY (FLD)						
FLD CHLORINE (COMB)	.	.	.	13	13	0
FLD CHLORINE FREE	.	.	.	13	13	0
FLD CHLORINE (TOTAL)	.	.	.	13	13	0
FLD PH	12	12	0	13	13	0
FLD TEMPERATURE	12	12	0	12	12	0
FLD TURBIDITY	12	12	0	13	13	0
*TOTAL SCAN CHEMISTRY (FLD)	36	36	0	77	77	0
CHEMISTRY (LAB)						
ALKALINITY	12	12	0	13	13	0
CALCIUM	12	12	0	13	13	0
CYANIDE	12	0	1	13	0	0
CHLORIDE	12	12	0	13	13	0
COLOUR	12	12	0	13	13	0
CONDUCTIVITY	12	12	0	13	13	0
DISS ORG CARBON	12	12	0	13	13	0
FLUORIDE	12	12	0	13	13	0
HARDNESS	12	12	0	13	13	0
IONCAL	12	12	0	13	13	0
LANGELIERS INDEX	12	12	0	13	13	0
MAGNESIUM	12	12	0	13	13	0
SODIUM	12	12	0	13	13	0
AMMONIUM TOTAL	12	9	2	13	1	3
NITRITE	12	12	0	13	2	11
TOTAL NITRATES	12	12	0	13	13	0
NITROGEN TOT KJELD	12	12	0	13	13	0
PH	12	12	0	13	13	0
PHOSPHORUS FIL REACT	12	10	2	13	4	8
PHOSPHORUS TOTAL	12	12	0	13	7	6
SULPHATE	12	12	0	13	13	0
TURBIDITY	12	12	0	13	12	1
*TOTAL SCAN CHEMISTRY (LAB)	264	247	5	286	234	29

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
METALS						
SILVER	12	0	2	13	0	2
ALUMINUM	12	11	0	13	13	0
ARSENIC	12	1	9	13	0	10
BARIUM	12	11	1	13	13	0
BORON	12	11	0	13	13	0
BERYLLIUM	12	0	9	13	0	3
CADMIUM	12	0	6	13	0	4
COBALT	12	0	12	13	0	10
CHROMIUM	12	1	8	13	1	10
COPPER	12	6	6	13	1	12
IRON	12	12	0	13	0	8
MERCURY	12	0	3	9	0	1
MANGANESE	12	11	1	13	13	0
MOLYBDENUM	12	8	4	13	13	0
NICKEL	12	4	4	13	4	1
LEAD	12	11	1	13	1	12
ANTIMONY	12	5	7	13	4	9
SELENIUM	12	1	6	13	0	8
STRONTIUM	12	11	1	13	13	0
TITANIUM	12	11	1	13	12	1
THALLIUM	12	0	2	13	0	1
URANIUM	12	10	2	13	10	3
VANADIUM	12	11	0	13	7	6
ZINC	12	11	1	13	13	0
*TOTAL SCAN METALS	288	147	86	308	131	101
*TOTAL GROUP INORGANIC & PHYSICAL	588	430	91	671	442	130
CHLOROAROMATICS						
HEXACHLOROBUTADIENE	11	0	0	13	0	0
123 TRICHLOROBENZENE	11	0	0	13	0	0
1234 T-CHLOROBENZENE	11	0	0	13	0	0
1235 T-CHLOROBENZENE	11	0	0	13	0	0
124 TRICHLOROBENZENE	11	0	0	13	0	0
1245 T-CHLOROBENZENE	11	0	0	13	0	0
135 TRICHLOROBENZENE	11	0	0	13	0	0
HCB	11	0	0	13	0	0
HEXACHLOROETHANE	11	0	0	13	0	0
OCTACHLOROSTYRENE	11	0	0	13	0	0
PENTACHLOROBENZENE	11	0	0	13	0	0
236 TRICHLOROTOLUENE	11	0	0	13	0	0
245 TRICHLOROTOLUENE	11	0	0	13	0	0
26A TRICHLOROTOLUENE	11	0	0	13	0	0
*TOTAL SCAN CHLOROAROMATICS	154	0	0	182	0	0
CHLOROPHENOLS						

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
234 TRICHLOROPHENOL	2	0	0	2	0	0
2345 T-CHLOROPHENOL	2	0	0	2	0	0
2356 T-CHLOROPHENOL	2	0	0	2	0	0
245-TRICHLOROPHENOL	2	0	0	2	0	0
246-TRICHLOROPHENOL	2	0	0	2	0	0
PENTACHLOROPHENOL	2	0	0	2	0	0
*TOTAL SCAN CHLOROPHENOLS	12	0	0	12	0	0
PAH						
PHENANTHRENE	12	0	0	13	0	0
ANTHRACENE	11	0	0	12	0	0
FLUORANTHENE	12	0	0	13	0	0
PYRENE	12	0	0	13	0	0
BENZO(A)ANTHRACENE	12	0	0	13	0	0
CHRYSENE	12	0	0	13	0	0
DIMETH. BENZ(A)ANTHR	10	0	0	12	0	0
BENZO(E) PYRENE	12	0	0	13	0	0
BENZO(B) FLUORANTHEN	12	0	0	13	0	0
PERYLENE	12	0	0	13	0	0
BENZO(K) FLUORANTHEN	12	0	2	13	0	0
BENZO(A) PYRENE	11	0	0	12	0	0
BENZO(G,H,I) PERYLEN	12	0	0	13	0	0
DIBENZO(A,H) ANTHRAC	12	0	0	13	0	0
INDENO(1,2,3-C,D) PY	12	0	0	13	0	0
BENZO(B) CHRYSENE	12	0	0	13	0	0
CORONENE	12	0	0	13	0	0
*TOTAL SCAN PAH	200	0	2	218	0	0
PESTICIDES & PCB						
ALDRIN	11	0	0	13	0	0
ALPHA BHC	11	0	1	13	0	2
BETA BHC	11	0	0	13	0	0
LINDANE	11	0	4	13	0	7
ALPHA CHLORDANE	11	0	0	13	0	0
GAMMA CHLORDANE	11	0	0	13	0	0
DIELDRIN	11	0	0	13	0	0
METHOXYCHLOR	11	0	0	13	0	0
ENDOSULFAN 1	11	0	0	13	0	0
ENDOSULFAN II	11	0	0	13	0	0
ENDRIN	11	0	0	13	0	0
ENDOSULFAN SULPHATE	11	0	0	13	0	0
HEPTACHLOR EPOXIDE	11	0	0	13	0	0
HEPTACHLOR	11	0	0	13	0	0
MIREX	11	0	0	13	0	0
OXYCHLORDANE	11	0	0	13	0	0
OPDDT	11	0	0	13	0	0
PCB	11	0	0	13	0	0
DDD	11	0	0	13	0	0
PPDDE	11	0	0	13	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
PPDDT	11	0	0	13	0	0
AMETRINE	12	0	0	13	0	0
ATRAZINE	12	1	9	13	1	10
ATRATONE	12	0	0	13	0	0
CYANAZINE (BLADEX)	12	0	0	13	0	0
DESETHYLATRAZINE	12	0	4	13	0	3
D-ETHYL SIMAZINE	11	0	0	12	0	0
PROMETONE	12	0	0	13	0	0
PROPAZINE	12	0	0	13	0	0
PROMETRYNE	12	0	0	13	0	0
METRIBUZIN (SENCOR)	12	0	0	13	0	0
SIMAZINE	12	0	0	13	0	0
ALACHLOR (LASSO)	12	0	0	13	0	0
METOLACHLOR	12	0	0	13	0	0
HEXACLCYCLOPENTADIEN	1	0	0	1	0	0
*TOTAL SCAN PESTICIDES & PCB	387	1	18	442	1	22
PHENOLICS						
PHENOLICS	12	6	3	13	7	2
*TOTAL SCAN PHENOLICS	12	6	3	13	7	2
SPECIFIC PESTICIDES						
TOXAPHENE	11	0	0	13	0	0
2,4,5-T	2	0	0	2	0	0
2,4-D	2	0	0	2	0	0
2,4-DB	2	0	0	2	0	0
2,4 D PROPIONIC ACID	2	0	0	2	0	0
DICAMBA	2	0	0	2	0	0
PICHLORAM	1	0	0	1	0	0
SILVEX	2	0	0	2	0	0
DIAZINON	2	0	0	2	0	0
DICHLOROVOS	2	0	0	2	0	0
CHLORPYRIFOS	2	0	0	2	0	0
ETHION	2	0	0	2	0	0
AZINPHOS-METHYL	0	0	0	0	0	0
MALATHION	2	0	0	2	0	0
MEVINPHOS	2	0	0	2	0	0
METHYL PARATHION	2	0	0	2	0	0
METHYLTRITHION	2	0	0	2	0	0
PARATHION	2	0	0	2	0	0
PHORATE	2	0	0	2	0	0
RELDAN	2	0	0	2	0	0
RONNEL	2	0	0	2	0	0
AMINOCARB	0	0	0	0	0	0
BENOMYL	0	0	0	0	0	0
BUX	0	0	0	0	0	0
CARBOFURAN	2	0	0	2	0	0
CICP	2	0	0	2	0	0
DIALLATE	2	0	0	2	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
EPTAM	2	0	0	2	0	0
IPC	2	0	0	2	0	0
PROPOXUR	2	0	0	2	0	0
CARBARYL	2	0	0	2	0	0
BUTYLATE	2	0	0	2	0	0
*TOTAL SCAN SPECIFIC PESTICIDES	64	0	0	66	0	0
VOLATILES						
BENZENE	12	0	0	13	0	3
TOLUENE	12	0	0	13	0	6
ETHYLBENZENE	12	0	0	13	0	7
P-XYLENE	12	0	0	13	0	0
M-XYLENE	12	0	0	13	0	1
O-XYLENE	12	0	0	13	0	1
STYRENE	12	0	2	13	0	7
1,1 DICHLOROETHYLENE	12	0	0	13	0	0
METHYLENE CHLORIDE	12	0	0	13	0	0
T1,2DICHLOROETHYLENE	12	0	0	13	0	0
1,1 DICHLOROETHANE	12	0	0	13	0	0
CHLOROFORM	12	2	9	13	13	0
111, TRICHLOROETHANE	12	0	6	13	0	2
1,2 DICHLOROETHANE	12	0	0	13	0	1
CARBON TETRACHLORIDE	12	0	0	13	0	0
1,2 DICHLOROPROPANE	12	0	0	13	0	0
TRICHLOROETHYLENE	12	0	0	13	0	0
DICHLOROBROMOMETHANE	12	1	2	13	13	0
112 TRICHLOROETHANE	12	0	0	13	0	0
CHLORODIBROMOMETHANE	12	0	1	13	10	3
T-CHLOROETHYLENE	12	0	0	13	0	1
BROMOFORM	12	0	0	13	0	1
1122 T-CHLOROETHANE	12	0	0	13	0	0
CHLOROBENZENE	12	0	0	13	0	0
1,4 DICHLOROBENZENE	12	0	0	13	0	0
1,3 DICHLOROBENZENE	12	0	0	13	0	0
1,2 DICHLOROBENZENE	12	0	0	13	0	0
ETHLYENE DIBROMIDE	12	0	0	13	0	0
TOTL TRIHALOMETHANES	12	1	2	13	13	0
*TOTAL SCAN VOLATILES	348	4	22	377	49	33
*TOTAL GROUP ORGANIC	1177	11	45	1310	57	57

KEY TO TABLE 5 and 6

A ONTARIO DRINKING WATER OBJECTIVES (ODWO)
1. Maximum Acceptable Concentration (MAC)
1+. MAC for Total Trihalomethanes
2. Interim Maximum Acceptable Concentration (IMAC)
3. Aesthetic Objective (AO)
3*. AO for Total Xylenes
4. Recommended Operational Guideline

B HEALTH & WELFARE CANADA (H&W)
1. Maximum Acceptable Concentration (MAC)
2. Proposed MAC
3. Interim MAC
4. Aesthetic Objective (AO)

C WORLD HEALTH ORGANIZATION (WHO)
1. Guideline Value (GV)
2. Tentative GV
3. Aesthetic GV

D US ENVIRONMENTAL PROTECTION AGENCY (EPA)
1. Maximum Contaminant Level (MCL)
2. Suggested No-Adverse Effect Level (SNAEL)
3. Lifetime Health Advisory
4. EPA Ambient Water Quality Criteria
4T. EPA Ambient Water Quality Criteria for Total PAH

F EUROPEAN ECONOMIC COMMUNITY (EEC)
1. Health Related Guideline Level
2. Aesthetic Guideline Level
3. Maximum Admissable Concentration (MADC)

G CALIFORNIA STATE DEPARTMENT OF HEALTH-GUIDELINE VALUE

I NEW YORK STATE AMBIENT WATER GUIDELINE

N/A NONE AVAILABLE

LABORATORY RESULTS, REMARK DESCRIPTIONS

.	No Sample Taken
BDL	Below Minimum Measurement Amount
<T	Greater Than Detection Limit But Not Confident (SEE INTERPRETATION OF RESULTS ABOVE)
>	Results Are Greater Than The Upper Limit
<=>	Approximate Result
!CS	No Data: Contamination Suspected
!IL	No Data: Sample Incorrectly Labelled
!IS	No Data: Insufficient Sample
!IV	No Data: Inverted Septum
!LA	No Data: Laboratory Accident
!LD	No Data: Test Queued After Sample Discarded
!NA	No Data: No Authorization To Perform Reanalysis
!NP	No Data: No Procedure
!NR	No Data: Sample Not Received
!OP	No Data: Obscured Plate
!QU	No Data: Quality Control Unacceptable
!PE	No Data: Procedural Error - Sample Discarded
!PH	No Data: Sample pH Outside Valid Range
!RE	No Data: Received Empty
!RO	No Data: See Attached Report (no numeric results)
!SM	No Data: Sample Missing
!SS	No Data: Send Separate Sample Properly Preserved
!UI	No Data: Indeterminant Interference
!TX	No Data: Time Expired
A3C	Approximate, Total Count Exceeded 300 Colonies
APL	Additional Peak, Large, Not Priority Pollutant
APS	Additional Peak, Less Than, Not Priority Pollutant
CIC	Possible Contamination, Improper Cap
CRO	Calculated Result Only
PPS	Test Performed On Preserved Sample
RMP	P and M-Xylene Not Separated
RRV	Rerun Verification
RVU	Reported Value Unusual
SPS	Several Peaks, Small, Not Priority Pollutant

UCR		Unreliable: Could Not Confirm By Reanalysis
UCS		Unreliable: Contamination Suspected
UIN		Unreliable: Indeterminate Interference
XP		Positive After X Number Of Hours
T#	(T06)	Result Taken After # Hours

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM
	RAW	TREATED	
BACTERIOLOGICAL			
FECAL COLIFORM MF (CT/100ML)		DET'N LIMIT = 0	GUIDELINE = 0 (A1)
FEB	212	.	
MAR	24	.	
APR	18	.	
MAY	6	.	
JUN	52	.	
JUL	140	.	
AUG	92	.	
SEP	32	.	
NOV	32	.	
STANDRD PLATE CNT MF (COUNTS/ML)		DET'N LIMIT = 0	GUIDELINE = 500/ML (A3)
FEB	.	0 <=>	
MAR	.	50	
APR	.	10	
MAY	.	36	
JUN	.	320	
JUL	.	40	
AUG	.	920	
SEP	.	140	
NOV	.	2 <=>	
TOTAL COLIFORM MF (CT/100ML)		DET'N LIMIT = 0	GUIDELINE = 5/100ML(A1)
FEB	6300	.	
MAR	10300	.	
APR	460	.	
MAY	800 <=>	.	
JUN	400 <=>	.	
JUL	1300 <=>	.	
AUG	200 <=>	.	
SEP	700 <=>	.	
NOV	280	.	
T COLIFORM BCKGRD MF (CT/100ML)		DET'N LIMIT = 0	GUIDELINE = N/A
FEB	22000	.	
MAR	22600	.	
APR	36000	.	
MAY	72000	.	
JUN	74000	.	
JUL	83000	.	
AUG	60000	.	
SEP	93000	.	
NOV	48000 >	.	

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM
	RAW	TREATED	
CHEMISTRY (FLD)			
FLD CHLORINE (COMB) (MG/L)		DET'N LIMIT = 0	GUIDELINE = N/A
JAN	.	.500	
FEB	.	.400	
MAR	.	.500	
APR	.	.450	
MAY	.	.600	
JUN	.	.700	
JUL	.	.600	
AUG	.	.500	
SEP	.	.500	
NOV	.	.600	
FLD CHLORINE FREE (MG/L)		DET'N LIMIT = 0	GUIDELINE = N/A
JAN	.	.500	
FEB	.	1.700	
MAR	.	1.200	
APR	.	1.300	
MAY	.	1.400	
JUN	.	1.200	
JUL	.	1.400	
AUG	.	1.000	
SEP	.	.500	
NOV	.	1.400	
FLD CHLORINE (TOTAL) (MG/L)		DET'N LIMIT = 0	GUIDELINE = N/A
JAN	.	1.000	
FEB	.	2.100	
MAR	.	1.700	
APR	.	1.750	
MAY	.	2.000	
JUN	.	1.900	
JUL	.	2.000	
AUG	.	1.500	
SEP	.	1.000	
NOV	.	2.000	
FLD PH (DMNSLESS)		DET'N LIMIT = N/A	GUIDELINE = 6.5-8.5(A4)
JAN	7.800	8.000	
FEB	7.500	7.500	
MAR	7.800	7.700	
APR	7.800	7.800	
MAY	8.200	8.200	
JUN	8.000	7.800	
JUL	8.200	7.700	
AUG	7.800	7.600	
SEP	7.600	8.200	
NOV	8.100	7.800	

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM
	RAW	TREATED	
FLD TEMPERATURE (DEG.C)		DET'N LIMIT = N/A	GUIDELINE = 15 (A3)
JAN	1.000	1.000	
FEB	1.000	1.500	
MAR	2.500	2.500	
APR	5.000	5.000	
MAY	13.000	13.000	
JUN	18.000	18.000	
JUL	23.000	23.000	
AUG	23.000	23.000	
SEP	24.000	24.000	
NOV	10.000	10.000	
FLD TURBIDITY (FTU)		DET'N LIMIT = N/A	GUIDELINE = 1 (A1)
JAN	10.200	.910	
FEB	31.000	.500	
MAR	33.000	.350	
APR	13.000	.300	
MAY	13.000	.800	
JUN	23.700	.700	
JUL	26.000	.800	
AUG	24.000	.500	
SEP	27.300	.600	
NOV	18.600	.500	

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM
	RAW	TREATED	
CHEMISTRY (LAB)			
ALKALINITY (MG/L)		DET'N LIMIT = 0.2	GUIDELINE = 30-500 (A3)
JAN	211.000	198.300	
FEB	145.700	130.200	
MAR	165.700	156.100	
APR	203.600	192.500	
MAY	200.600	193.100	
JUN	207.100	196.100	
JUL	193.700	185.400	
AUG	168.100	157.800	
SEP	168.600	154.900	
NOV	233.500	223.400	
CALCIUM (MG/L)		DET'N LIMIT = 0.2	GUIDELINE = 100 (F2)
JAN	130.000	92.100	
FEB	59.400	59.200	
MAR	70.600	70.000	
APR	95.600	91.400	
MAY	92.700	89.800	
JUN	92.600	93.400	
JUL	86.600	87.800	
AUG	79.300	79.200	
SEP	74.800	73.200	
NOV	92.300	93.100	
CYANIDE (MG/L)		DET'N LIMIT = 0.001	GUIDELINE = .2 (A1)
JAN	.004 <T	BDL	
FEB	BDL	BDL	
MAR	BDL	BDL	
APR	BDL	BDL	
MAY	BDL	BDL	
JUN	BDL	BDL	
JUL	BDL	BDL	
AUG	BDL	BDL	
SEP	BDL	BDL	
NOV	BDL	BDL	
CHLORIDE (MG/L)		DET'N LIMIT = 0.2	GUIDELINE = 250 (A3)
JAN	93.300	105.000	
FEB	34.100	46.100	
MAR	29.700	37.300	
APR	57.100	65.000	
MAY	68.700	75.500	
JUN	63.800	69.100	
JUL	65.400	74.200	
AUG	71.700	79.100	
SEP	58.300	65.400	
NOV	52.800	60.000	

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED		
COLOUR (HZU)			DET'N LIMIT = 0.5	GUIDELINE = 5 (A3)
JAN	22.500	9.000		
FEB	22.000	2.500		
MAR	18.500	6.000		
APR	15.500	5.000		
MAY	16.500	5.000		
JUN	21.000	6.500		
JUL	18.000	5.000		
AUG	12.500	3.500		
SEP	15.000	6.000		
NOV	21.500	6.500		
CONDUCTIVITY (UMHO/CM)			DET'N LIMIT = 1.	GUIDELINE = 400 (F2)
JAN	1139	911		
FEB	501	525		
MAR	526	536		
APR	755	771		
MAY	807	821		
JUN	793	806		
JUL	772	793		
AUG	757	772		
SEP	678	680		
NOV	754	766		
DISS ORG CARBON (MG/L)			DET'N LIMIT = .100	GUIDELINE = 5.0 (A3)
JAN	5.200	5.300		
FEB	4.700	2.500		
MAR	5.100	4.100		
APR	4.500	3.600		
MAY	5.000	4.500		
JUN	5.300	4.600		
JUL	5.300	4.500		
AUG	4.500	3.800		
SEP	5.500	4.300		
NOV	5.800	4.800		
FLUORIDE (MG/L)			DET'N LIMIT = 0.01	GUIDELINE = 2.4 (A1)
JAN	.280	.160		
FEB	.160	.080		
MAR	.140	.100		
APR	.140	.120		
MAY	.180	.160		
JUN	.180	.160		
JUL	.200	.160		
AUG	.180	.160		
SEP	.160	.140		
NOV	.180	.160		

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED		
HARDNESS (MG/L)			DET'N LIMIT = 0.5	GUIDELINE = 80-100 (A4)
JAN	470.200	323.400		
FEB	205.000	204.000		
MAR	241.000	239.000		
APR	328.000	316.000		
MAY	329.300	324.600		
JUN	329.700	334.100		
JUL	314.000	319.000		
AUG	296.600	297.000		
SEP	271.000	265.000		
NOV	326.000	330.400		
IONCAL (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = N/A
JAN	2.759	2.712		
FEB	3.950	4.269		
MAR	.154	.874		
APR	1.469	3.727		
MAY	1.705	3.478		
JUN	.985	1.157		
JUL	.499	.631		
AUG	2.104	1.975		
SEP	.693	1.278		
NOV	2.555	.474		
LANGELIERS INDEX (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = N/A
JAN	1.171	1.115		
FEB	.716	.614		
MAR	.945	.784		
APR	1.240	1.126		
MAY	1.248	1.217		
JUN	1.152	1.081		
JUL	1.175	1.171		
AUG	1.026	.987		
SEP	1.046	.939		
NOV	1.345	1.299		
MAGNESIUM (MG/L)			DET'N LIMIT = 0.1	GUIDELINE = 30 (F2)
JAN	35.400	22.750		
FEB	13.900	13.600		
MAR	15.600	15.500		
APR	21.500	21.300		
MAY	23.800	24.400		
JUN	23.900	24.500		
JUL	23.800	24.100		
AUG	24.000	24.150		
SEP	20.400	19.900		
NOV	23.200	23.800		

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM
	RAW	TREATED	
SODIUM (MG/L)			DET'N LIMIT = 0.2 GUIDELINE = 200 (A4)
JAN	57.000	58.600	
FEB	18.200	20.200	
MAR	15.000	16.800	
APR	32.000	34.400	
MAY	38.200	40.400	
JUN	39.100	38.100	
JUL	41.600	43.200	
AUG	42.700	44.000	
SEP	36.200	35.600	
NOV	31.000	32.600	
AMMONIUM TOTAL (MG/L)			DET'N LIMIT = 0.002 GUIDELINE = 0.05 (F2)
JAN	.702	BDL	
FEB	.226	BDL	
MAR	.108	.006 <T	
APR	.188	BDL	
MAY	.006 <T	BDL	
JUN	.020	BDL	
JUL	.004 <T	BDL	
AUG	.082	.008 <T	
SEP	BDL	.010	
NOV	.030	.006 <T	
NITRITE (MG/L)			DET'N LIMIT = 0.001 GUIDELINE = 1 (A1)
JAN	.040	.002 <T	
FEB	.130	.001 <T	
MAR	.081	.005	
APR	.057	.001 <T	
MAY	.025	.001 <T	
JUN	.022	.001 <T	
JUL	.025	.006	
AUG	.025	.001 <T	
SEP	.156	.002 <T	
NOV	.040	.001 <T	
TOTAL NITRATES (MG/L)			DET'N LIMIT = 0.005 GUIDELINE = 10 (A1)
JAN	3.490	3.790	
FEB	3.630	3.640	
MAR	3.830	3.800	
APR	3.820	3.840	
MAY	2.140	2.130	
JUN	2.500	2.410	
JUL	3.370	3.510	
AUG	1.370	1.370	
SEP	1.420	1.320	
NOV	3.020	3.000	

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM
	RAW	TREATED	
NITROGEN TOT KJELD (MG/L)			DET'N LIMIT = 0.02 GUIDELINE = N/A
JAN	1.320	.570	
FEB	1.050	.370	
MAR	.840	.490	
APR	.930	.450	
MAY	.830	.570	
JUN	.870	.550	
JUL	.930	.530	
AUG	.860	.420	
SEP	.930	.420	
NOV	.675	.470	
PH (DMNSLESS)			DET'N LIMIT = N/A GUIDELINE = 6.5-8.5(A4)
JAN	8.230	8.340	
FEB	8.240	8.190	
MAR	8.340	8.210	
APR	8.430	8.360	
MAY	8.460	8.460	
JUN	8.350	8.300	
JUL	8.430	8.440	
AUG	8.380	8.370	
SEP	8.420	8.360	
NOV	8.490	8.460	
PHOSPHORUS FIL REACT (MG/L)			DET'N LIMIT = 0.0005 GUIDELINE = N/A
JAN	.042	.004	
FEB	.073	.001 <T	
MAR	.039	.002 <T	
APR	.020	.001 <T	
MAY	.001 <T	.001 <T	
JUN	.001 <T	BDL	
JUL	.011	.001 <T	
AUG	.019	.002 <T	
SEP	.030	.001 <T	
NOV	.012	.002 <T	
PHOSPHORUS TOTAL (MG/L)			DET'N LIMIT = 0.002 GUIDELINE = .40 (F2)
JAN	.076	.019	
FEB	.135	.005 <T	
MAR	.120	.009 <T	
APR	.077	.010	
MAY	.055	.013	
JUN	.088	.008 <T	
JUL	.106	.012	
AUG	.096	.010	
SEP	.103	.011	
NOV	.068	.011	

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM
	RAW	TREATED	
SULPHATE (MG/L)		DET'N LIMIT = .200	GUIDELINE = 500 (A3)
JAN	247.820	99.150	
FEB	46.860	48.020	
MAR	49.660	48.400	
APR	101.210	103.000	
MAY	109.740	114.780	
JUN	108.190	114.730	
JUL	100.420	102.820	
AUG	103.400	106.490	
SEP	92.060	90.790	
NOV	81.290	81.030	
TURBIDITY (FTU)		DET'N LIMIT = 0.05	GUIDELINE = 1 (A1)
JAN	11.300	1.030	
FEB	35.000	.710	
MAR	30.000	.340	
APR	20.000	.340	
MAY	14.700	.880	
JUN	37.000	.420	
JUL	29.000	.480	
AUG	27.000	.220 <T	
SEP	42.000	.570	
NOV	19.300	.510	

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM
	RAW	TREATED	
METALS			
SILVER (UG/L)			DET'N LIMIT = 0.05 GUIDELINE = 50 (A1)
JAN	BDL	BDL	
FEB	BDL	BDL	
MAR	BDL	BDL	
APR	BDL	BDL	
MAY	BDL	BDL	
JUN	BDL	.060 <T	
JUL	BDL	BDL	
AUG	.060 <T	BDL	
SEP	.060 <T	.360 <T	
NOV	BDL	BDL	
ALUMINUM (UG/L)			DET'N LIMIT = 0.10 GUIDELINE = 100 (A4)
JAN	150.000	160.000	
FEB	340.000	40.000	
MAR	270.000	110.000	
APR	230.000	85.000	
MAY	210.000	410.000	
JUN	280.000	430.000	
JUL	280.000	250.000	
AUG	260.000	190.000	
SEP	BDL	87.000	
NOV	230.000	180.000	
ARSENIC (UG/L)			DET'N LIMIT = 0.10 GUIDELINE = 25 (A1)
JAN	.380 <T	BDL	
FEB	.630 <T	.310 <T	
MAR	.450 <T	.180 <T	
APR	.420 <T	.430 <T	
MAY	.740 <T	.350 <T	
JUN	BDL	BDL	
JUL	.860 <T	.730 <T	
AUG	1.200	.310 <T	
SEP	.290 <T	.200 <T	
NOV	BDL	BDL	
BARIUM (UG/L)			DET'N LIMIT = 0.05 GUIDELINE = 1000 (A2)
JAN	37.000	39.000	
FEB	26.000	20.000	
MAR	26.000	21.000	
APR	32.000	27.000	
MAY	38.000	34.000	
JUN	41.000	36.000	
JUL	39.000	34.000	
AUG	40.000	37.000	
SEP	.090 <T	24.000	
NOV	34.000	30.000	

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM
	RAW	TREATED	
BORON (UG/L)			DET'N LIMIT = 2.00 GUIDELINE = 5000 (A1)
JAN	53.000	53.000	
FEB	23.000	25.000	
MAR	33.000	32.000	
APR	57.000	52.000	
MAY	120.000	80.000	
JUN	140.000	130.000	
JUL	66.000	63.000	
AUG	88.000	87.000	
SEP	BDL	34.000	
NOV	49.000	51.000	
BERYLLIUM (UG/L)			DET'N LIMIT = 0.05 GUIDELINE = 6800 (D4)
JAN	BDL	BDL	
FEB	.060 <T	BDL	
MAR	.060 <T	BDL	
APR	.060 <T	BDL	
MAY	.070 <T	BDL	
JUN	.130 <T	.190 <T	
JUL	.060 <T	BDL	
AUG	.110 <T	.070 <T	
SEP	BDL	BDL	
NOV	.070 <T	BDL	
CADMIUM (UG/L)			DET'N LIMIT = 0.05 GUIDELINE = 5 (A1)
JAN	BDL	BDL	
FEB	.090 <T	BDL	
MAR	BDL	BDL	
APR	BDL	BDL	
MAY	.100 <T	.120 <T	
JUN	BDL	BDL	
JUL	BDL	.060 <T	
AUG	.070 <T	BDL	
SEP	.140 <T	BDL	
NOV	BDL	.060 <T	
COBALT (UG/L)			DET'N LIMIT = 0.02 GUIDELINE = N/A
JAN	.280 <T	.140 <T	
FEB	.260 <T	BDL	
MAR	.610 <T	BDL	
APR	.320 <T	.140 <T	
MAY	.470 <T	.400 <T	
JUN	.340 <T	.040 <T	
JUL	.610 <T	.350 <T	
AUG	.320 <T	.080 <T	
SEP	.040 <T	.090 <T	
NOV	.250 <T	.070 <T	

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED		
CHROMIUM (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = 50 (A1)
JAN	BDL	BDL		
FEB	1.100 <T	.770 <T		
MAR	4.200 <T	3.600 <T		
APR	3.600 <T	2.700 <T		
MAY	3.500 <T	1.200 <T		
JUN	6.000	4.700 <T		
JUL	3.200 <T	2.400 <T		
AUG	4.700 <T	4.200 <T		
SEP	BDL	2.400 <T		
NOV	2.700 <T	2.400 <T		
COPPER (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = 1000 (A3)
JAN	4.500 <T	2.400 <T		
FEB	42.000	2.100 <T		
MAR	4.400 <T	1.700 <T		
APR	11.000	1.800 <T		
MAY	7.300	1.800 <T		
JUN	5.100	2.100 <T		
JUL	4.200 <T	2.600 <T		
AUG	19.000	2.100 <T		
SEP	.650 <T	9.800		
NOV	2.400 <T	1.900 <T		
IRON (UG/L)			DET'N LIMIT = 6.00	GUIDELINE = 300 (A3)
JAN	180.000	25.000 <T		
FEB	480.000	BDL		
MAR	430.000	7.100 <T		
APR	330.000	6.100 <T		
MAY	300.000	22.000 <T		
JUN	370.000	13.000 <T		
JUL	490.000	BDL		
AUG	450.000	BDL		
SEP	570.000	16.000 <T		
NOV	370.000	BDL		
MERCURY (UG/L)			DET'N LIMIT = 0.02	GUIDELINE = 1 (A1)
JAN	.020 <T	.		
FEB	.030 <T	BDL		
MAR	BDL	.040 <T		
APR	BDL	BDL		
MAY	BDL	BDL		
JUN	BDL	BDL		
JUL	BDL	BDL		
AUG	BDL	BDL		
SEP	BDL	BDL		
NOV	BDL	BDL		

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM
	RAW	TREATED	
MANGANESE (UG/L)			DET'N LIMIT = 0.05 GUIDELINE = 50 (A3)
JAN	27.000	4.000	
FEB	35.000	1.100	
MAR	52.000	1.500	
APR	39.000	1.300	
MAY	49.000	7.000	
JUN	83.000	4.100	
JUL	69.000	3.900	
AUG	67.000	1.300	
SEP	.350 <T	3.600	
NOV	33.000	1.700	
MOLYBDENUM (UG/L)			DET'N LIMIT = 0.05 GUIDELINE = N/A
JAN	.840	1.000	
FEB	.180 <T	.580	
MAR	.370 <T	.560	
APR	.490 <T	.820	
MAY	1.500	1.800	
JUN	1.000	1.600	
JUL	1.300	1.800	
AUG	1.400	2.100	
SEP	.140 <T	1.300	
NOV	.940	1.400	
NICKEL (UG/L)			DET'N LIMIT = 0.20 GUIDELINE = 350 (D3)
JAN	2.400	2.300	
FEB	BDL	BDL	
MAR	BDL	BDL	
APR	.460 <T	BDL	
MAY	3.200	2.800	
JUN	BDL	BDL	
JUL	2.800	2.700	
AUG	2.400	2.300	
SEP	1.800 <T	BDL	
NOV	.610 <T	.340 <T	
LEAD (UG/L)			DET'N LIMIT = 0.05 GUIDELINE = 10. (A1)
JAN	1.300	.230 <T	
FEB	30.000	.200 <T	
MAR	1.200	.120 <T	
APR	1.800	.350 <T	
MAY	1.300	.210 <T	
JUN	1.900	.190 <T	
JUL	2.800	.320 <T	
AUG	2.500	.310 <T	
SEP	.120 <T	.780	
NOV	1.100	.120 <T	

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED		
ANTIMONY (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 146 (D4)
JAN	.400 <T	.430 <T		
FEB	.310 <T	.320 <T		
MAR	.900	.260 <T		
APR	.390 <T	.460 <T		
MAY	.530	.490 <T		
JUN	.510	.590		
JUL	.560	.720		
AUG	.560	.610		
SEP	.070 <T	.550		
NOV	.400 <T	.490 <T		
SELENIUM (UG/L)			DET'N LIMIT = 1.00	GUIDELINE = 10 (A1)
JAN	1.700 <T	BDL		
FEB	1.100 <T	1.700 <T		
MAR	BDL	BDL		
APR	BDL	BDL		
MAY	1.400 <T	1.600 <T		
JUN	1.600 <T	3.300 <T		
JUL	1.800 <T	BDL		
AUG	BDL	1.200 <T		
SEP	7.100	1.100 <T		
NOV	BDL	1.200 <T		
STRONTIUM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = N/A
JAN	1300.000	790.000		
FEB	300.000	300.000		
MAR	310.000	300.000		
APR	610.000	600.000		
MAY	840.000	850.000		
JUN	860.000	860.000		
JUL	730.000	680.000		
AUG	810.000	810.000		
SEP	1.000 <T	160.000		
NOV	590.000	580.000		
TITANIUM (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = N/A
JAN	14.000	9.700		
FEB	12.000	6.400		
MAR	17.000	10.000		
APR	17.000	9.900		
MAY	21.000	14.000		
JUN	21.000	14.000		
JUL	25.000	16.000		
AUG	15.000	8.100		
SEP	3.400 <T	4.700 <T		
NOV	12.000	6.400		

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM
	RAW	TREATED	
THALLIUM (UG/L)			DET'N LIMIT = 0.05 GUIDELINE = 13 (D4)
JAN	BDL	BDL	
FEB	BDL	BDL	
MAR	BDL	BDL	
APR	BDL	BDL	
MAY	.060 <T	BDL	
JUN	BDL	BDL	
JUL	BDL	BDL	
AUG	BDL	BDL	
SEP	.170 <T	BDL	
NOV	BDL	BDL	
URANIUM (UG/L)			DET'N LIMIT = 0.05 GUIDELINE = 100 (A1)
JAN	1.100	.890	
FEB	.500 <T	.150 <T	
MAR	.660	.510	
APR	.790	.680	
MAY	.690	.690	
JUN	.840	.730	
JUL	.660	.620	
AUG	.550	.430 <T	
SEP	.110 <T	.250 <T	
NOV	.900	.830	
VANADIUM (UG/L)			DET'N LIMIT = 0.05 GUIDELINE = N/A
JAN	.630	.600	
FEB	1.300	.540	
MAR	1.100	.540	
APR	.880	.450 <T	
MAY	.930	.580	
JUN	.830	.320 <T	
JUL	1.600	.910	
AUG	1.400	.700	
SEP	BDL	.500 <T	
NOV	.970	.360 <T	
ZINC (UG/L)			DET'N LIMIT = 0.20 GUIDELINE = 5000 (A3)
JAN	17.000	8.700	
FEB	15.000	3.800	
MAR	11.000	2.700	
APR	11.000	5.600	
MAY	13.000	5.800	
JUN	16.000	7.100	
JUL	14.000	7.100	
AUG	14.000	5.500	
SEP	.240 <T	4.300	
NOV	9.800	5.700	

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM
	RAW	TREATED	
PAH			
BENZO(K) FLUORANTHEN (NG/L)		DET'N LIMIT = 1.	GUIDELINE = N/A
JAN	BDL	BDL	
FEB	BDL	BDL	
MAR	1.000 <T	BDL	
APR	BDL	BDL	
MAY	BDL	BDL	
JUN	BDL	BDL	
JUL	BDL	BDL	
AUG	BDL	BDL	
SEP	1.000 <T	BDL	
NOV	BDL	BDL	

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM
	RAW	TREATED	
PESTICIDES & PCB			
ALPHA BHC (NG/L)		DET'N LIMIT = 1.000	GUIDELINE = 700 (G)
JAN	BDL	1.000 <T	
FEB	BDL	BDL	
MAR	ILA	BDL	
APR	BDL	BDL	
MAY	BDL	BDL	
JUN	BDL	BDL	
JUL	BDL	BDL	
AUG	BDL	BDL	
SEP	BDL	BDL	
NOV	2.000 <T	2.000 <T	
LINDANE (NG/L)		DET'N LIMIT = 1.000	GUIDELINE = 4000 (A1)
JAN	BDL	7.000 <T	
FEB	2.000 <T	BDL	
MAR	ILA	BDL	
APR	BDL	BDL	
MAY	2.000 <T	5.000 <T	
JUN	BDL	1.000 <T	
JUL	2.000 <T	3.000 <T	
AUG	BDL	4.000 <T	
SEP	BDL	3.000 <T	
NOV	BDL	BDL	
ATRAZINE (NG/L)		DET'N LIMIT = 50	GUIDELINE = 60000 (A2)
JAN	BDL	BDL	
FEB	370.000 <T	440.000 <T	
MAR	420.000 <T	410.000 <T	
APR	230.000 <T	150.000 <T	
MAY	BDL	BDL	
JUN	200.000 <T	210.000 <T	
JUL	3200.000	3040.000	
AUG	300.000 <T	320.000 <T	
SEP	210.000 <T	200.000 <T	
NOV	350.000 <T	360.000 <T	
DESETHYLATRAZINE (NG/L)		DET'N LIMIT = 200.0	GUIDELINE = 60000 (A)
JAN	BDL	BDL	
FEB	200.000 <T	200.000 <T	
MAR	290.000 <T	240.000 <T	
APR	BDL	BDL	
MAY	BDL	BDL	
JUN	BDL	BDL	
JUL	580.000 <T	570.000 <T	
AUG	BDL	BDL	
SEP	BDL	BDL	
NOV	BDL	BDL	

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM
	RAW	TREATED	
PHENOLICS (UG/L)	PHENOLICS	DET'N LIMIT = .2	GUIDELINE = 2 (A4)
JAN	2.200	3.200	
FEB	1.000	1.000	
MAR	1.600	1.600	
APR	1.600	1.200	
MAY	.400 <T	.800 <T	
JUN	BDL	BDL	
JUL	.600 <T	1.800	
AUG	.400 <T	BDL	
SEP	BDL	BDL	
NOV	BDL	BDL	

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED		
VOLATILES				
BENZENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 5 (A1)
JAN	BDL	BDL		
FEB	BDL	BDL		
MAR	BDL	BDL		
APR	BDL	.050 <T		
MAY	BDL	.100 <T		
JUN	BDL	.050 <T		
JUL	BDL	BDL		
AUG	BDL	BDL		
SEP	BDL	BDL		
NOV	BDL	BDL		
TOLUENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 24 (A3)
JAN	BDL	BDL		
FEB	BDL	.050 <T		
MAR	BDL	BDL		
APR	BDL	.100 <T		
MAY	BDL	.300 <T		
JUN	BDL	.050 <T		
JUL	BDL	BDL		
AUG	BDL	BDL		
SEP	BDL	.100 <T		
NOV	BDL	BDL		
ETHYLBENZENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 2.4 (A3)
JAN	BDL	BDL		
FEB	BDL	BDL		
MAR	BDL	BDL		
APR	BDL	.100 <T		
MAY	BDL	.150 <T		
JUN	BDL	.100 <T		
JUL	BDL	BDL		
AUG	BDL	.150 <T		
SEP	BDL	.100 <T		
NOV	BDL	.050 <T		
M-XYLENE (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 300 (A3*)
JAN	BDL	BDL		
FEB	BDL	BDL		
MAR	BDL	BDL		
APR	BDL	BDL		
MAY	BDL	.200 <T		
JUN	BDL	BDL		
JUL	BDL	BDL		
AUG	BDL	BDL		
SEP	BDL	BDL		
NOV	BDL	BDL		

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM
	RAW	TREATED	
O-XYLENE (UG/L)			DET'N LIMIT = 0.05 GUIDELINE = 300 (A3*)
JAN	BDL	BDL	
FEB	BDL	BDL	
MAR	BDL	BDL	
APR	BDL	BDL	
MAY	BDL	.100 <T	
JUN	BDL	BDL	
JUL	BDL	BDL	
AUG	BDL	BDL	
SEP	BDL	BDL	
NOV	BDL	BDL	
STYRENE (UG/L)			DET'N LIMIT = 0.05 GUIDELINE = 100 (D1)
JAN	BDL	.050 <T	
FEB	.100 <T	BDL	
MAR	BDL	BDL	
APR	BDL	.050 <T	
MAY	BDL	.100 <T	
JUN	BDL	.150 <T	
JUL	BDL	BDL	
AUG	BDL	.150 <T	
SEP	BDL	.150 <T	
NOV	BDL	.100 <T	
CHLOROFORM (UG/L)			DET'N LIMIT = 0.10 GUIDELINE = 350 (A1+)
JAN	1.400	150.000	
FEB	BDL	89.400	
MAR	.200 <T	100.600	
APR	.500 <T	80.000	
MAY	.100 <T	116.200	
JUN	.200 <T	127.300	
JUL	.100 <T	130.300	
AUG	.100 <T	97.500	
SEP	11.000	84.700	
NOV	.200 <T	103.500	
111, TRICHLOROETHANE (UG/L)			DET'N LIMIT = 0.02 GUIDELINE = 200 (D1)
JAN	.080 <T	BDL	
FEB	BDL	BDL	
MAR	.100 <T	.080 <T	
APR	.100 <T	.100 <T	
MAY	BDL	BDL	
JUN	BDL	BDL	
JUL	.040 <T	BDL	
AUG	BDL	BDL	
SEP	BDL	BDL	
NOV	BDL	BDL	

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED		
1,2 DICHLOROETHANE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 5 (A1)
JAN	BDL	BDL		
FEB	BDL	BDL		
MAR	BDL	BDL		
APR	BDL	.100 <T		
MAY	BDL	BDL		
JUN	BDL	BDL		
JUL	BDL	BDL		
AUG	BDL	BDL		
SEP	BDL	BDL		
NOV	BDL	BDL		
DICHLOROBROMOMETHANE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 350 (A1+)
JAN	.100 <T	23.400		
FEB	BDL	9.200		
MAR	BDL	9.800		
APR	.050 <T	16.100		
MAY	BDL	23.150		
JUN	BDL	33.150		
JUL	BDL	24.050		
AUG	BDL	24.100		
SEP	1.850	17.300		
NOV	BDL	15.400		
CHLORODIBROMOMETHANE (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 350 (A1+)
JAN	BDL	2.000		
FEB	BDL	.500 <T		
MAR	BDL	.500 <T		
APR	BDL	2.000		
MAY	BDL	2.700		
JUN	BDL	6.400		
JUL	BDL	2.700		
AUG	BDL	3.900		
SEP	.200 <T	2.300		
NOV	BDL	1.500		
T-CHLOROETHYLENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 5 (D1)
JAN	BDL	BDL		
FEB	BDL	BDL		
MAR	BDL	BDL		
APR	BDL	.050 <T		
MAY	BDL	BDL		
JUN	BDL	BDL		
JUL	BDL	BDL		
AUG	BDL	BDL		
SEP	BDL	BDL		
NOV	BDL	BDL		

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM CAYUGA WTP 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM
	RAW	TREATED	
BROMOFORM (UG/L)		DET'N LIMIT = 0.20	GUIDELINE = 350 (A1+)
JAN	BDL	BDL	
FEB	BDL	BDL	
MAR	BDL	BDL	
APR	BDL	BDL	
MAY	BDL	BDL	
JUN	BDL	.200 <T	
JUL	BDL	BDL	
AUG	BDL	BDL	
SEP	BDL	BDL	
NOV	BDL	BDL	
TOTL TRIHALOMETHANES (UG/L)		DET'N LIMIT = 0.50	GUIDELINE = 350 (A1)
JAN	1.500 <T	175.450	
FEB	BDL	99.100	
MAR	BDL	110.900	
APR	.550 <T	98.100	
MAY	BDL	142.050	
JUN	BDL	167.100	
JUL	BDL	157.050	
AUG	BDL	125.450	
SEP	13.050	104.300	
NOV	BDL	120.450	

TRACE LEVELS OF TOLUENE ARE LABORATORY ARTIFACTS DERIVED FROM THE ANALYTICAL METHODOLOGY.

TRACE LEVELS OF STYRENE ARE CONSIDERED TO BE LABORATORY ARTIFACTS RESULTING FROM THE LABORATORY SHIPPING CONTAINERS.

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
BACTERIOLOGICAL			
FECAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	0 (A1)
STANDARD PLATE COUNT MEMBRANE FILT.	CT/ML	0	500/ML (A3)
TOTAL COLIFORM BACKGROUND MF	CT/100ML	0	N/A
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	5/100ML (A1)
CHEMISTRY (FLD)			
FIELD COMBINED CHLORINE RESIDUAL	MG/L	0	N/A
FIELD TOTAL CHLORINE RESIDUAL	MG/L	0	N/A
FIELD FREE CHLORINE RESIDUAL	MG/L	0	N/A
FIELD PH	DMNSLESS	N/A	6.5-8.5 (A3)
FIELD TEMPERATURE	DEG.C	N/A	15.0 (A3)
FIELD TURBIDITY	FTU	N/A	1.0 (A1)
CHEMISTRY (LAB)			
ALKALINITY	MG/L	0.2	30-500 (A3)
AMMONIUM TOTAL	MG/L	0.002	0.05 (F2)
CALCIUM	MG/L	0.2	100 (F2)
CHLORIDE	MG/L	0.2	250 (A3)
COLOUR	TCU	0.5	5.0 (A3)
CONDUCTIVITY	UMHO/CM	1.0	400 (F2)
CYANIDE	MG/L	0.001	0.2 (A1)
DISSOLVED ORGANIC CARBON	MG/L	0.1	5.0 (A3)
FLUORIDE	MG/L	0.01	2.4 (A1)
HARDNESS	MG/L	0.5	80-100 (A4)
LANGELIERS INDEX	DMNSLESS	N/A	N/A
MAGNESIUM	MG/L	0.1	30.0 (F2)
NITRITE	MG/L	0.001	1.0 (A1)
NITROGEN TOTAL KJELDAHL	MG/L	0.02	N/A
PH	DMNSLESS	N/A	6.5-8.5 (A4)
PHOSPHORUS FIL REACT	MG/L	0.0005	N/A
PHOSPHORUS TOTAL	MG/L	0.002	0.4 (F2)
SODIUM	MG/L	0.2	200 (A4)
SULPHATE	MG/L	0.2	500 (A3)
TOTAL NITRATES	MG/L	0.005	10.0 (A1)
TURBIDITY	FTU	0.05	1.0 (A1)
CHLOROAROMATICS			
123 TRICHLOROBENZENE	NG/L	5.0	N/A
1234 TETRACHLOROBENZENE	NG/L	1.0	N/A
1235 TETRACHLOROBENZENE	NG/L	1.0	N/A
124 TRICHLOROBENZENE	NG/L	5.0	10000 (I)
1245-TETRACHLOROBENZENE	NG/L	1.0	38000 (D4)
135 TRICHLOROBENZENE	NG/L	5.0	N/A
236 TRICHLOROTOLUENE	NG/L	5.0	N/A
245 TRICHLOROTOLUENE	NG/L	5.0	N/A
26A TRICHLOROTOLUENE	NG/L	5.0	N/A
HEXACHLOROBENZENE	NG/L	1.0	10 (C1)
HEXACHLOROBUTADIENE	NG/L	1.0	450 (D4)
HEXACHLOROCYCLOPENTADIENE	NG/L	5.0	206000 (D4)
HEXACHLOROETHANE	NG/L	1.0	1900 (D4)
OCTACHLOROSTYRENE	NG/L	1.0	N/A
PENTACHLOROBENZENE	NG/L	1.0	74000 (D4)
CHLOROPHENOLS			
234 TRICHLOROPHENOL	NG/L	100.0	N/A
2345 TETRACHLOROPHENOL	NG/L	20.0	N/A
2356 TETRACHLOROPHENOL	NG/L	10.0	N/A

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
245 TRICHLOROPHENOL	NG/L	100.0	2600000 (D4)
246 TRICHLOROPHENOL	NG/L	20.0	5000 (A1)
PENTACHLOROPHENOL	NG/L	10.0	60000 (A1)
METALS			
ALUMINUM	UG/L	0.10	100 (A4)
ANTIMONY	UG/L	0.05	146 (D4)
ARSENIC	UG/L	0.10	25 (A1)
BARIUM	UG/L	0.05	1000 (A2)
BERYLLIUM	UG/L	0.05	6800 (D4)
BORON	UG/L	2.00	5000 (A1)
CADMIUM	UG/L	0.05	5 (A1)
CHROMIUM	UG/L	0.50	50 (A1)
COBALT	UG/L	0.02	N/A
COPPER	UG/L	0.50	1000 (A3)
IRON	UG/L	6.00	300 (A3)
LEAD	UG/L	0.05	10 (A1)
MANGANESE	UG/L	0.05	50 (A3)
MERCURY	UG/L	0.02	1 (A1)
MOLYBDENUM	UG/L	0.05	N/A
NICKEL	UG/L	0.20	350 (D3)
SELENIUM	UG/L	1.00	10 (A1)
SILVER	UG/L	0.05	50 (A1)
STRONTIUM	UG/L	0.10	N/A
THALLIUM	UG/L	0.05	13 (D4)
TITANIUM	UG/L	0.50	N/A
URANIUM	UG/L	0.05	100 (A1)
VANADIUM	UG/L	0.05	N/A
ZINC	UG/L	0.20	5000 (A3)
PAH			
ANTHRACENE	NG/L	1.0	N/A
BENZO(A) ANTHRACENE	NG/L	20.0	N/A
BENZO(A) PYRENE	NG/L	5.0	10.0 (A1)
BENZO(B) CHRYSENE	NG/L	2.0	N/A
BENZO(B) FLUORANTHENE	NG/L	10.0	N/A
BENZO(E) PYRENE	NG/L	50.0	N/A
BENZO(G,H,I) PERYLENE	NG/L	20.0	N/A
BENZO(K) FLUORANTHENE	NG/L	1.0	N/A
CHRYSENE	NG/L	50.0	N/A
CORONENE	NG/L	10.0	N/A
DIBENZO(A,H) ANTHRACENE	NG/L	10.0	N/A
DIMETHYL BENZO(A) ANTHRACENE	NG/L	5.0	N/A
FLUORANTHENE	NG/L	20.0	42000.0 (D4)
INDENO(1,2,3-C,D) PYRENE	NG/L	20.0	N/A
PERYLENE	NG/L	10.0	N/A
PHENANTHRENE	NG/L	10.0	N/A
PYRENE	NG/L	20.0	N/A
PESTICIDES & PCB			
ALACHLOR (LASSO)	NG/L	500.0	5000 (A2)
ALDRIN	NG/L	1.0	700 (A1)
ALPHA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	700 (G)
ALPHA CHLORDANE	NG/L	2.0	7000 (A1)
AMETRINE	NG/L	50.0	300000 (D3)
ATRATONE	NG/L	50.0	N/A
ATRAZINE	NG/L	50.0	60000 (A2)
DES ETHYL ATRAZINE	NG/L	200.0	60000 (A2)
BETA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	300 (G)
CYANAZINE (BLADEX)	NG/L	100.0	10000 (A2)
O,P-DDD	NG/L	5.0	10 (I)
DIELDRIN	NG/L	2.0	700 (A1)
ENDOSULFAN 1 (THIODAN I)	NG/L	2.0	74000 (D4)
ENDOSULFAN 2 (THIODAN II)	NG/L	5.0	74000 (D4)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
ENDOSULFAN SULPHATE (THIODAN SULPHATE)	NG/L	5.0	N/A
ENDRIN	NG/L	5.0	1600 (D3)
GAMMA CHLORDANE	NG/L	2.0	7000 (A1)
HEPTACHLOR	NG/L	1.0	3000 (A1)
HEPTACHLOR EPOXIDE	NG/L	1.0	3000 (A1)
LINDANE (GAMMA BHC)	NG/L	1.0	4000 (A1)
METHOXYCHLOR	NG/L	5.0	900000 (A1)
METOLACHLOR	NG/L	500.0	50000 (A2)
METRIBUZIN (SENCOR)	NG/L	100.0	80000 (A1)
MIREX	NG/L	5.0	N/A
P,P-DDD	NG/L	5.0	N/A
O,P-DDT	NG/L	5.0	30000 (A1)
OXYCHLORDANE	NG/L	2.0	N/A
PCB	NG/L	20.0	3000 (A2)
PPDDE	NG/L	1.0	30000 (A1)
PPDDT	NG/L	5.0	30000 (A1)
PROMETONE	NG/L	50.0	52500 (D3)
PROMETRYNE	NG/L	50.0	1000 (A2)
PROPAZINE	NG/L	50.0	700000 (D3)
SIMAZINE	NG/L	50.0	10000 (A2)
D-ETHYL SIMAZINE	NG/L	200.0	10000 (A2)
TOXAPHENE	NG/L	500.0	5000 (A1)
PHENOLICS			
PHENOLICS (UNFILTERED REACTIVE)	UG/L	0.2	2 (A4)
SPECIFIC PESTICIDES			
2,4 D PROPIONIC ACID	NG/L	100.	N/A
2,4,5-TRICHLOROPHENOXY ACETIC ACID	NG/L	50.	280000 (A1)
2,4-DICHLOROBUTYRIC ACID (2,4-D)	NG/L	100.	100000 (A1)
24-DICHLORORPHENOXYBUTYRIC ACID (24-DB)	NG/L	200.	18000 (B3)
BUTYLATE (SUTAN)	NG/L	2000.	245000 (D3)
CARBARYL (SEVIN)	NG/L	200.	90000 (A1)
CARBOFURAN	NG/L	2000.	90000 (A1)
CHLORPYRIFOS (DURSBAN)	NG/L	20.	N/A
CICP (CHLORPROPHAM)	NG/L	2000.	350000 (G)
DIALLATE	NG/L	2000.	N/A
DIAZINON	NG/L	20.	20000 (A1)
DICAMBA	NG/L	50.	120000 (A1)
DICHLOROVOS	NG/L	20.	N/A
EPTAM	NG/L	2000.	N/A
ETHION	NG/L	20.	35000 (G)
IPC	NG/L	2000.	N/A
MALATHION	NG/L	20.	190000 (A1)
METHYL PARATHION	NG/L	50.	7000 (B3)
METHYLTRITHION	NG/L	20.	N/A
MEVINPHOS	NG/L	20.	N/A
PARATHION	NG/L	20.	50000 (A1)
PHORATE (THIMET)	NG/L	20.	2000 (A2)
PROPOXUR (BAYGON)	NG/L	2000.	140000 (D3)
RELDAN	NG/L	20.	N/A
RONNEL	NG/L	20.	N/A
SILVEX (2,4,5-TP)	NG/L	20.	10000 (A1)
VOLATILES			
1,1 DICHLOROETHANE	UG/L	0.10	N/A
1,1 DICHLOROETHYLENE	UG/L	0.10	7 (D1)
1,2 DICHLOROBENZENE	UG/L	0.05	200 (A1)
1,2 DICHLOROETHANE	UG/L	0.05	5 (A1)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
1,2 DICHLOROPROPANE	UG/L	0.05	5 (D1)
1,3 DICHLOROBENZENE	UG/L	0.10	3750 (D3)
1,4 DICHLOROBENZENE	UG/L	0.10	5 (A1)
111, TRICHLOROETHANE	UG/L	0.02	200 (D1)
112 TRICHLOROETHANE	UG/L	0.05	0.6 (D4)
1122 TETRACHLOROETHANE	UG/L	0.05	0.17(D4)
BENZENE	UG/L	0.05	5 (A1)
BROMOFORM	UG/L	0.20	350 (A1+)
CARBON TETRACHLORIDE	UG/L	0.20	5 (A1)
CHLOROBENZENE	UG/L	0.10	1510 (D3)
CHLORODIBROMOMETHANE	UG/L	0.10	350 (A1+)
CHLOROFORM	UG/L	0.10	350 (A1+)
DICHLOROBROMOMETHANE	UG/L	0.05	350 (A1+)
ETHLYENE DIBROMIDE	UG/L	0.05	50 (D1)
ETHYLBENZENE	UG/L	0.05	2.4 (A3)
M-XYLENE	UG/L	0.10	300 (A3*)
METHYLENE CHLORIDE	UG/L	0.50	50 (A1)
O-XYLENE	UG/L	0.05	300 (A3*)
P-XYLENE	UG/L	0.10	300 (A3*)
STYRENE	UG/L	0.05	100 (D1)
TETRACHLOROETHYLENE	UG/L	0.05	5 (D1)
TRANS 1,2 DICHLOROETHYLENE	UG/L	0.10	70 (D1)
TOLUENE	UG/L	0.05	24 (A3)
TOTAL TRIHALOMETHANES	UG/L	0.50	350 (A1)
TRICHLOROETHYLENE	UG/L	0.10	50 (A1)

Appendix A

DRINKING WATER SURVEILLANCE PROGRAM
PROGRAM DESCRIPTION

The Drinking Water Surveillance Program (DWSP) for Ontario monitors drinking water quality at municipal water supply systems. The DWSP Database Management System provides a computerized drinking water quality information system for the supplies monitored. The objectives of the program are to provide:

- immediate, reliable, current information on drinking water quality;
- a flagging mechanism for guideline exceedance;
- a definition of contaminant levels and trends;
- a comprehensive background for remedial action;
- a framework for assessment of new contaminants; and
- an indication of treatment efficiency of plant processes.

PROGRAM

The DWSP officially began in April 1986 and is designed to eventually include all municipal water supplies in Ontario. In 1990, 76 systems were being monitored. Water supply locations have been prioritized for surveillance based primarily on criteria such as population density, probability of contamination and geographical location.

An ongoing assessment of future monitoring requirements at each location will be made. Monitoring will continue at the initial locations at an appropriate level and further locations will be phased into the program as resources permit.

A major goal of the program is to collect valid water quality data in context with plant operational characteristics at the time of sampling. As soon as sufficient data have been accumulated and analyzed, both the frequency of sampling and the range of parameters may be adjusted accordingly.

Assessments are carried out at all locations prior to initial sampling, in order to acquire complete plant process and distribution system details and to designate (and retrofit if necessary) all sampling systems and locations. This ensures that the sampled water is a reflection of the water itself.

Samples are taken of raw (ambient water) and treated water at the treatment plant and of consumer's tap water in the distribution system. In order to determine possible effects of distribution on water quality, both standing and free flow water in old and new sections of the distribution system are sampled. Sampling is carried out by operational personnel who have been trained in applicable procedures.

Comprehensive standardized procedures and field test kits are supplied to sampling personnel. This ensures that samples are taken and handled according to standard protocols and that field testing will supply reliable data. All field and laboratory analyses are carried out using "approved documented procedures". Most laboratory analyses are carried out by the Ministry of Environment (MOE), Laboratory Services Branch. Radionuclides are analyzed by the Ministry of Labour.

DATA REPORTING MECHANISM

When the analytical results are transferred from the MOE laboratory into the DWSP system, printouts of the completed analyses are sent to the MOE District Officer, the appropriate operational staff and are also retained by the DWSP unit.

PROGRAM INPUTS AND OUTPUTS

There are four major inputs and four major outputs in the program.

Program Input - Plant and Distribution System Description

The system description includes plant specific non-analytical information acquired through a questionnaire and an initial plant visit. During the initial assessment of the plant and distribution system, questionnaire content is verified and missing information added. It is intended that all data be kept current with scheduled annual updates.

The Plant and Distribution System Description consists of the following seven components:

1. PROCESS COMPONENT INVENTORY

All physical and chemical processes to which the water is subjected, from the intake pipe to the consumers' tap (where possible), are documented. These include: process type, general description of physical structures, material types, sizes, and retention time for each process within the plant. The processes may be as simple as transmission or as complex as carbon adsorption.

2. TREATMENT CHEMICALS

Chemicals used in the treatment processes, their function, application point, supplier and brand-name are recorded. Chemical dosages applied on the day of sampling are recorded in DWSP.

3. PROCESS CONTROL MEASUREMENTS

Documentation of in-plant monitoring of process parameters (eg. turbidity, chlorine residuals, pH, aluminum residuals) including methods used, monitoring locations and frequency is contained in this section. Except for the recorded Field Data, in-plant monitoring results are not retained in DWSP but are retained by the water treatment plant personnel.

4. DESIGN FLOW AND RETENTION TIME

Hydraulic capacity, designed and actual, is noted here. Retention time (the time that a block of water is retained in the plant) is also noted. Maximum, minimum and average flow, as well as a record of the flow rate on the day of sampling, are recorded in DWSP.

5. DISTRIBUTION SYSTEM DESCRIPTION

This area includes the storage and transmission characteristics of the distribution system after the water leaves the plant.

6. SAMPLING SYSTEM

Each plant is assessed for its adequacy in terms of the sampling of bacteriological, organic and inorganic parameters. Prime considerations in the assessment and design of the sampling system are:

i/ the sample is an accurate representation of the actual water condition, eg. raw water has had no chemical treatment;

ii/ the water being sampled is not being modified by the sampling system;

iii/ the sample tap must be in a clean area of the plant, preferably a lab area; and

iv/ the sample lines must be organically inert (no plastic, ideally stainless steel).

It is imperative that the sampled water be a reflection not of the sampling system but of the water itself.

The sampling system documentation includes: origin of the water; date sampling was initiated; size, length and material type (intake,

discharge and tap); pump characteristics (model, type, capacity); and flow rate.

7. PERSONNEL
This section contains the names, addresses and phone numbers of current plant management and operational staff, distribution system management and operational staff, Medical Officer of Health and appropriate MOE personnel associated with the plant.

Program Input - Field Data

The second major input to DWSP is field data. Field data is collected at the plant and from the distribution system sites on the day of sampling. Field data consists of general operating conditions and the results of testing for field parameters. General operating conditions include chemicals used, dosages, flow and retention time on the day of sampling, as well as, monthly maximum, minimum and average flows. Field parameters include turbidity, chlorine residuals (free, combined and total), temperature and pH. These parameters are analyzed according to standardized DWSP protocols to allow for interplant comparison.

Program Input - Laboratory Analytical Data

The third major input to DWSP is Laboratory Analytical Data. Samples gathered from the raw, treated and distribution sampling sites are analyzed for the presence of approximately 180 parameters at a frequency of two to twelve times per year. Sixty-five percent of the parameters are organic. Parameters measured may have health or aesthetic implications when present in drinking water. Many of the parameters may be used in the treatment process or may be treatment by-products. Due to the nature of certain analytical instruments, parameters may be measured in a "scan" producing some results for parameters that are not on the DWSP priority list, but which may be of interest. The majority of parameters are measured on a routine basis. Those that are technically more difficult and/or costly to analyze, however, are done less frequently. These include Specific Pesticides and Chlorophenols.

Although the parameter list is extensive, additional parameters with the potential to cause health or aesthetic related problems may be added provided reliable analytical and sampling methods exist.

All laboratory generated data is derived from standardized, documented analytical protocols. The analytical method is an integral part of the data and as methods change, notation will be made and comparison data documented.

Program Input - Parameter Reference Information

The fourth major input to DWSP is Parameter Reference Information. This is a catalogue of information for each substance analyzed on DWSP. It includes parameter name and aliases, physical and chemical properties, basic toxicology, world-wide health limits, treatment methods and uses. The Parameter Reference Information is computerized and can be accessed through the Query function of the DWSP database. An example is shown in figure 1.

Program output - Query

All DWSP information is easily accessed through the Query function, therefore, anything from addresses of plant personnel to complete water quality information for a plant's water supply is instantly available. The DWSP computer system makes relatively complex inquiries manageable. A personal password allowing access into the DWSP query mode in all MOE offices is being developed by the DWSP group.

Program Output - Action Alerts

Drinking Water quality in Ontario is evaluated against provincial objectives as outlined in the Ontario Drinking Water Objectives publication. Should the reported level of a substance in treated water exceed the Ontario Drinking Water Objective, an "Action Alert" requiring resampling and confirmation is issued. This assures that operational staff, health authorities and the public are notified as soon as possible of the confirmation of an exceedance and remedial action taken. This report supplies a history of the occurrence of past exceedances at the plant plus a historical summary on the parameter of concern.

In the absence of Ontario Drinking Water Objectives, guidelines/limits from other agencies are used. The Parameter Listing System, published by MOE (ISBN 0-7729-4461-X), catalogues and keeps current guidelines for 650 parameters from agencies throughout the world. If these guidelines are exceeded, the results are flagged and evaluated by DWSP personnel. An "Action Alert" will be issued if warranted.

Program Output - Report Generation

Custom reports can be generated from DWSP to meet MOE Regional needs and to respond to public requests.

Program Output - Annual Reports

It is the practice of DWSP to produce an annual report containing analytical data along with companion plant information.

FIG.1

MOE - DRINKING WATER ASSESSMENT PROGRAM (DWSP)

PARAMETER REFERENCE INFORMATION

BENZENE (B2001P) VOLATILES

CLASS: HEALTH METHOD: POCODO UNIT: µg/L

SOURCE	FROM	TO	METHOD	GUIDELINE	UNIT	NOTE
CAL C	85/01			0.700	µg/L	AL
CDWG C	87/01			5.000	µg/L	MAC
EPA C	87/07			5.000	µg/L	MCL
EPAA C	80/11			6.600	µg/L	AMBIENT **
FERC C	84/05			1.000	µg/L	MCL
WHO C	84/01			10.000	µg/L	GV

DESCRIPTION: **NAME:** BENZENE
CAS#: 71-43-2
MOLECULAR FORMULAE: C_6H_6
DETECTION LIMIT: (FOR METHOD POCODO) 0.05 µg/L
SYNONYMS: BENZOL; BENZOLE; COAL NAPHTHA; CARBON OIL (27). CYCLOHEXATRIENE (41).
CHARACTERISTICS: COLOURLESS TO LIGHT-YELLOW, MOBILE, NON-POLAR LIQUID, OF HIGHLY REFRACTIVE NATURE, AROMATIC ODOUR; VAPOURS BURN WITH SMOKING FLAME (30).
PROPERTIES: SOLUBILITY IN WATER: 1780-1800 mg/L AT 25C (41). THRESHOLD ODOUR: 0.5 - 10 PPM IN WATERTHRESHOLD TASTE: 0.5 mg/L IN WATER (39).
ENVIRONMENTAL FATE: MAY BIOACCUMULATE IN LIVING ORGANISMS AND APPEARS TO ACCUMULATE IN ANIMAL TISSUES THAT EXHIBIT A HIGH LIPID CONTENT OR REPRESENT MAJOR METABOLIC SITES, SUCH AS LIVER OR BRAIN; SMALL QUANTITIES EVAPORATE FROM SOILS OR ARE DEGRADED RATHER QUICKLY (80).
SOURCES: COMMERCIAL: PETROLEUM REFINING; SOLVENT RECOVERY; COAL TAR DISTILLATION (39); FOOD PROCESSING AND TANNING INDUSTRIES; COMBUSTION OF CAR EXHAUST.
ENVIRONMENTAL: POSSIBLE SOURCE IS RUNOFF.

USES: DETERGENTS; NYLON; INTERMEDIATE IN PRODUCTION OF OTHER COMPOUNDS, SUCH AS PESTICIDES; SOLVENT FOR EXTRACTION AND RECTIFICATION IN RUBBER INDUSTRY; DEGREASING AND CLEANSING AGENT; GASOLINE.

TOXICITY: RATING: 4 (VERY TOXIC).
ACUTE: IRRITATING TO MUCOUS MEMBRANES; SYMPTOMS INCLUDE RESTLESSNESS, CONVULSIONS, EXCITEMENT, DEPRESSION; DEATH MAY FOLLOW RESPIRATORY FAILURE.
CHRONIC: MAY CAUSE ANAEMIA AND LEUKAEMIA (45); MUTAGENIC.
MODE OF ACTION: CHROMOABERRATION IN LYMPHOCYTE CULTURES.

CARCINOGENICITY: A KNOWN HUMAN CARCINOGEN.

REMOVAL: THE FOLLOWING PROCESSES HAVE BEEN SUCCESSFUL IN REMOVING BENZENE FROM WASTEWATER: GAC ADSORPTION, PRECIPITATION WITH ALUM AND SUBSEQUENT REMOVAL VIA SEDIMENTATION, COAGULATION AND FLOCCULATION, SOLVENT EXTRACTION, OXIDATION

ADDITIONAL PROPERTIES:
MOLECULAR WEIGHT: 78.12
MELTING POINT: 5.5°C (27).
BOILING POINT: 80.1°C (27).
SPECIFIC GRAVITY: 0.8790 AT 20°C (27).
VAPOUR PRESSURE: 100 MM AT 26.1°C (27).
HENRY'S LAW CONSTANT: 0.00555 ATM-M3/MOLE (41).
LOG OCT./WATER PARTITION COEFFICIENT: 1.95 TO 2.13 (39).
CARBON ADSORPTION: K=1.0; 1/N=1.6; R=0.97; PH=5.3 (41)SEDIMENT/WATER PARTITION COEFFICIENT: NO DATA

NOTES: EPA PRIORITY POLLUTANT.

Appendix B

DWSP SAMPLING GUIDELINE

i) Raw and Treated at Plant

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Bacteriological	-220 mL plastic bottle with white seal on cap -do <u>not</u> rinse bottle, preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid (HNO_3) (**Caution:** HNO_3 is corrosive)
Volatiles (duplicates) (OPOPUP)	-45 mL glass vial with septum (teflon side must be in contact with sample) -do <u>not</u> rinse bottle -fill bottle completely without bubbles
Organics (OWOC),(OWTRI),(OAPAHX)	-1 L amber glass bottle per scan -do <u>not</u> rinse bottle -fill to 2 cm from top -when 'special pesticides' are requested three extra bottles must be filled

Cyanide	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops sodium hydroxide (NaOH) (**Caution:** NaOH is corrosive)
Mercury	-250 mL glass bottle -rinse bottle and cap three times -fill to top of label -add 20 drops each nitric acid (HNO_3) and potassium dichromate ($K_2Cr_2O_7$) (**Caution:** HNO_3&$K_2Cr_2O_7$ are corrosive)
Phenols	-250 mL glass bottle -do <u>not</u> rinse bottle, preservative has been added -fill to top of label
Radionuclides **(as scheduled)**	-4 L plastic jug -do <u>not</u> rinse, carrier added -fill to 5 cm from top
Organic Characterization **(GC/MS - once per year)**	-1 L amber glass bottle; instructions as per organic -250 mL glass bottle -do <u>not</u> rinse bottle -fill completely without bubbles

<u>Steps:</u>

1. Let sampling water tap run for an adequate time to clear the sample line.

2. Record time of day on submission sheet.

3. Record temperature on submission sheet.

4. Fill up all bottles as per instructions.

5. Record chlorine residuals (free, combined and total for treated water only), turbidity and pH on submission sheet.

ii) Distribution Samples (standing water)

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid (HNO_3) (**Caution:** HNO_3 is corrosive)

Steps:

1. Record time of day on submission sheet.
2. Place bucket under tap and open cold water.
3. Fill to predetermined volume.
4. After mixing the water, record the temperature on the submission sheet.
5. Fill general chemistry and metals bottles.
6. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.

iii) Distribution Samples (free flow)

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Bacteriological	-250 mL plastic bottle with white seal on cap -do not rinse bottle, preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked

Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid HNO_3 (**Caution:** HNO_3 is corrosive)
Volatiles (duplicate) (OPOPUP)	-45 mL glass vial with septum (teflon side must be in contact with sample) -do <u>not</u> rinse bottle, preservative has been added -fill bottle completely without bubbles
Organics (OWOC) (OAPAHX)	-1 L amber glass bottle per scan -do <u>not</u> rinse bottle -fill to 2 cm from top

<u>Steps:</u>

1. Record time of day on submission sheet.

2. Let cold water flow for five minutes.

3. Record temperature on submission sheet.

4. Fill all bottles as per instructions.

5. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.